

The effect of the application of mono-lauric acid with glycerol mono-laurate in weaned piglets, on the use of antimicrobials in sow herds

De Snoeck^{1,*}

S., van der Wolf² P., Swart², W., Heijman³, E., Ebbinge³, B.

¹ Veterinary Practice Lintjeshof, Nederweert, The Netherlands

² Animal Health Service, Deventer, The Netherlands

³ Daavision B.V., Oss, The Netherlands

* corresponding author: s.desnoeck@lintjeshof.com

Abstract

The Dutch government has obliged the pig industry to reduce the use of antimicrobials at farm level with 50% by 2013. The search for alternatives for antimicrobials and other tools which can improve the health status of the farm is intensified. One example of an alternative for antimicrobials is Daafit, a combination of lauric acid and glycerol-mono-laurate, produced by the firm Daavision B.V.. Daafit is used by Veterinary practice Lintjeshof to increase the health of pigs, specifically weaned piglets at a dose of 1 kg per ton dry feed. The weaned piglets are supplemented with this additive during the entire weaning period (7 – 25 kg body weight).

Veterinary Practice Lintjeshof has compiled a dataset with the DD/AY (Daily Dose per Animal Year) of 33 test farms which used the additive Daafit and 29 control farms which did not use the product. Data analysis by the Veterinary practice Lintjeshof showed that the DD/AY of antimicrobials on sow farms who used Daafit was lower when this product was used compared to other sow farms within Veterinary Practice Lintjeshof. To investigate whether this effect was statistically significant, the Animal Health Service was asked to analyze this dataset. The change in the DD/AY from the period before and during the use of Daafit was calculated for both test and control farms (delta-DD/AY). The dataset showed a significant difference between the delta-DD/AY for the sow farms that used Daafit in the weaned piglet feed in comparison with farms where Daafit was not used. The DD/AY was reduced with approximately 8 days on the test farms while the DD/AY on the control farms remained the same. These results indicate that Daafit might help reduce the use of antimicrobials in sow herds.

Introduction

After years of an increasing use of antimicrobials on pig farms the Dutch government obliged the pig industry to reduce the use of antimicrobials by 20% in 2011 and by 50% by 2013. This obligation triggered the increasing interest in alternatives for antimicrobials such as mono-laurate. Mono-laurate is a medium chain fatty acid with antimicrobial properties against a wide range of microbes (http://en.wikipedia.org/wiki/Glyceryl_laurate). The Dutch firm Daavision B.V. (www.daavision.com) produces a product called Daafit which is a mixture of lauric acid and glycerol-mono-laurate. This product is used in a dose of 1 kilogram product per 1000 kilogram of compound feed in weaned piglets. Aim of this additive is to reduce the number of bacteria circulating among these weaned piglets, especially *Streptococcus suis*. As a result of a lower number of circulating bacteria fewer treatments with antimicrobials are necessary, resulting in a smaller number of Daily Doses per Animal Year (DD/AY) per herd.

Material and methods

Veterinary Practice Lintjeshof has compiled a dataset where the DD/AY (Daily Dose per Animal Year) of 32 test farms and 29 control farms is calculated.

The DD/AY was calculated according to the guideline given by the Veterinary Pharmacy of the Faculty of Veterinary Medicine at Utrecht University as described in the MARAN report 2009.

Quote page 14 of MARAN 2009: "For example, a farm with 150 fattening pigs with an average weight of 70.2 kg used 2 litres of antibiotic preparation X during the course of one year (X contains 40% = 400 mg/ml active ingredient a) and 20 kg of antibiotic preparation Y (Y contains 25% = 250 mg/g active ingredient b). Antibiotic preparation X: the defined daily dosage of active ingredient is 10 mg per kg animal weight per day. Antibiotic preparation Y: the defined daily dosage of active ingredient is 50 mg per kg animal weight per day.

Antibiotic X can be used to treat $(2,000 * 400)/10 = 80,000$ kg animal weight. Antibiotic Y can be used to treat

$(20,000 * 250)/50 = 100,000$ kg animal weight. Consequently, the farm has used antibiotics for treatment of a total of 180,000 kg animal weight. The farm has an average of 150 fattening pigs per year, with a total weight of 10,530 kg. 180,000 kg were treated in that year, equivalent to $180,000/10,530 = 17.1$ daily dosages. Consequently, an average fattening pig on the farm in that year was administered a prescribed dosage of antibiotics on 17.1 days. In this example the farm uses 17.1 daily dosages per animal year of antibiotic preparation X plus Y."

For two swine categories standard body weights have been set: for sows and for fatteners/finishers. To calculate the number of kilograms animal present at a farm one needs to know the number of sows, weaned piglets, maiden gilts and boars and multiply by the respective standard body weight (www.antibioticawijzer.nl).

The DD/AY has been calculated for the category sows during the period that Daafit was being supplied and a period before that had the same length. The period during which the supplement was added varied from 4 to 6 months. The DD/AY was calculated with the help of a calculating module developed by the Agricultural Economic Institute (LEI), based on the rules of the pharmacy from the Faculty for Veterinary Medicine as described above.

The dataset supplied to the Animal Health Service contained the following fields: farm identification, number of sows, piglets, gilts and fattening pigs , whether there was being vaccinated or not against PCV2, PRRS, Mycoplasma Hyopneumoniae or with a autogenous vaccine against Streptococcus Suis and also the DD/AY in the period before and during the use of Daafit . De change in DD/AY was calculated by subtracting the DD/AY-before from the DD/AY-during. A reduction in DD/AY would show as a negative value. Statistical analysis was done using Statistix 8.0 and Stata/SA 11.2 for Windows.

Results

The control farms had overall more sows than the test farms , the median for the test farms was 440 sows and for the control farms 685 sows. This difference is statistically significant (Statistix 8.0, Median test, $P=0.03$). The DD/AY of the periods before the use of Daafit in the test and control farms were comparable (Statistix 8.0 , Wilcoxon rank sum test , $P=0.97$).

The descriptive statistics of Delta DD are presented in table 1 and figure 1.

Initial inoculum CFU/10gr	Method		1		2		3		4	
	Name		InviMag Stool DNA		QLAmp DNA Stool		Lysis reagent		Extraction DNA mix	
	Pretreatment		*	**	*	**	*	**	*	**
24 CFU/10gr			148	102	8	2,2	200	200	200	200
81 CFU/10gr			82	110	5	2,3	200	195	200	199
136 CFU/10gr			184	91	4	1,8	200	185	200	199

Table 1. Descriptive statistics of DD/AY before and during use of Daafit and delta-DD/AY for test and control farms

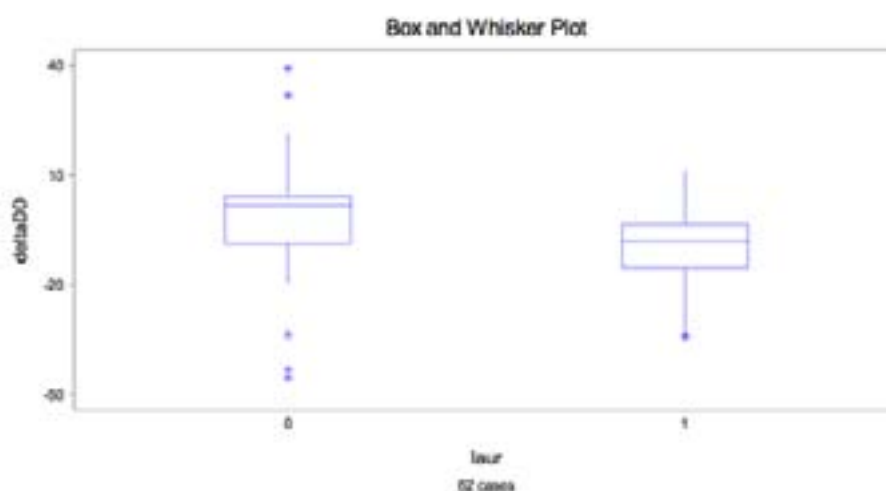


Figure 1. Box and Whisker plot for the delta-DD/AY for test (1) and control (0) farms.

The Two sample Wilcoxon rank-sum (Mann-Whitney) test of delta-DD/AY for test and control herds showed a significant difference ($z=2.674$, $P=0.0075$).

Discussion

This method of data-analysis in which antimicrobial use in the periods before and during the application of a certain product in test and control farms are being compared with one another, can only be seen as an indication of the efficacy of this product. In the test design and the statistical analysis we did not correct for the many factors which might have an influence on the change of DD/AY e.g. herd size. Also, the test design was not randomized and blind so a “placebo effect” can not be ruled out in this study. This is why a definite conclusion on the causality between the use of Daafit and the improvement of the DD/AY based on these data is not possible. However, these data show that the effect of Daafit on the reduction of DD/AY in the test herds can not be ruled out and that Daafit might help in the reduction of the use of antimicrobials on sow farms.

Conclusion

The data show a significant reduction in the use of antimicrobials (daily dosage per animal year) in the herd category sows in the period before and during the use of Daafit in the feed of the weaned piglets, in comparison with farms where Daafit was not used where this reduction did not occur. The daily dose per animal year was reduced by approximately 8 days in the test herds.

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Literature references

Mevius, D., Koene, M., Wit, B., van Pelt, W., Bondt, N. (editors), 2011, MARAN-2009 – Monitoring of Antimicrobial Resistance and Antibiotic Usage in Animals in The Netherlands in 2009, Publisher CVI/WUR, 67 pages, available at www.maran.wur.nl (last visited April 27. 2011).